PRE-COMBUSTION CAPTURE OF CARBON DIOXIDE

Pre-combustion solvent absorption

Advanced power generation technologies are under development that can make much cleaner and more efficient use of fossil fuels such as coal. Integrated Gasification Combined Cycle (IGCC) is one such technique, converting coal to a combustible gas known as syngas (containing hydrogen, carbon monoxide and carbon dioxide) at high temperature and pressure. IGCC uses a gas turbine followed by a steam turbine to generate electricity.

Solvent absorption is the current industry method for removing carbon dioxide (CO_2) from syngas. Liquid chemicals are used to absorb the CO_2 and then release it at an elevated temperature in another vessel.

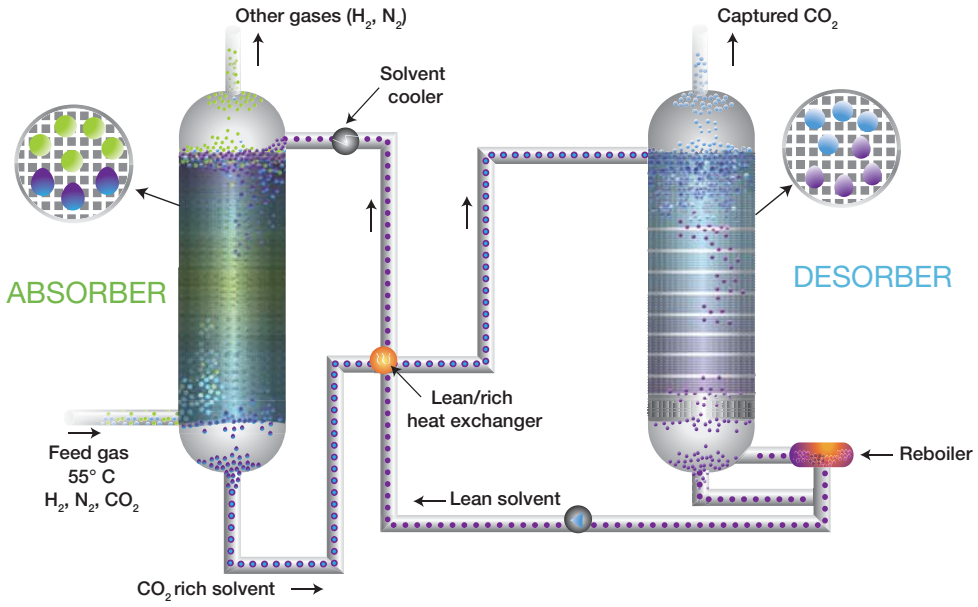
After the gasification of the coal and various gas cleaning steps, the gas enters the absorption column. There it comes into contact with the solvent which absorbs the CO_2. The other gases leave the absorption column, and the "rich" solvent containing the CO_2 is then pumped to another column called a stripping column.

The "rich" solvent is then heated to about 120°C, causing the CO_2 to be released from the solvent. The CO_2 emerges at the top of the stripper column where it is cooled, allowing the removal of water and traces of solvents. The liquid is returned to the top of the stripper column and the "lean" solvent is pumped from the bottom back to the absorber.

On the way, the hot, lean solvent passes through a heat exchanger, along with the rich solvent leaving the absorber column. This cools the lean solvent, ready for more CO_2 absorption, and heats the rich solvent on its way to the stripper column. The solvent can be used over and over again to perform the separation of CO_2.

The CO2CRC Mulgrave Capture Project is undertaking research into solvent capture. The research aims to:

- trial a potassium carbonate-promoted solvent system and compare its performance to the traditional amine solvent (MEA);
- reduce the energy required to heat the solvent to release the CO_2 and to cool the lean solvent and the CO_2;
- control or prevent the solvent degrading or corroding equipment;
- improve the amount of CO_2 captured/released by the solvent through the use of novel packing material in the columns;
- understand the interaction between the solvent system and impurities present in the syngas, including H_2S, CH_4 and CO; and
- reduce the cost of carbon capture and make solvent absorption technologies more commercially viable.



Solvent-based absorption CO_2 capture.

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